Baryon number fluctuation and critical point

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We investigate the relationship between the peak value of baryon number fluctuation kurtosis and the critical baryon chemical potential. At the same time, the freeze-out curves under different position of the critical end point. We control the position of the critical end point by include the fermion vacuum fluctuation gradually. This work is done under the low energy Polyakov-quark-meson model with the functional renormalization group approach.

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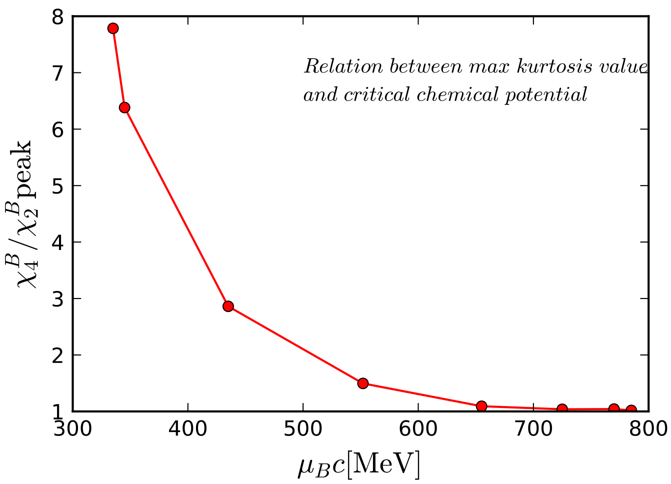

FIG. 1. The relation between the max baryon number fluctuation kurtosis value and the baryon chemical potential of the critical end point.

I. INTRODUCTION

The location of the critical end point (CEP) of the QCD phase diagram is a popular research direction in the field of high energy physics. However, the physical property at high baryon chemical potential is hard to study in both theoretical and experimental. In the experimental field, the Relativistic Heavy Ion Collider (RHIC) that provides us with a lot of experimental data [1–3].
which is also called as the n-th order generalized susceptibility of the baryon number. χ_n^B's in Eq. (1) are related to the cumulants of the baryon number distributions, e.g.,

$$\chi_1^B = \frac{1}{VT^3}\langle N_B\rangle\,, \tag{2}$$

$$\chi_2^B = \frac{1}{VT^3}\langle(\delta N_B)^2\rangle\,, \tag{3}$$

$$\chi_3^B = \frac{1}{VT^3}\langle(\delta N_B)^3\rangle\,, \tag{4}$$

$$\chi_4^B = \frac{1}{VT^3}\Big(\langle(\delta N_B)^4\rangle - 3\langle(\delta N_B)^2\rangle^2\Big)\,, \tag{5}$$

IV.

A.

V. RESULTS AND SUMMARY

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II.

III.

$$\chi_n^B = \frac{\partial^n}{\partial(\mu_B/T)^n}\frac{p}{T^4}\,, \tag{1}$$

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